obovatis ochraceis, capillitio suprà libero obovato erecto sporidiisque concoloribus. Darw. No. 224.

On the rough bark of palms. Rio Janeiro. May 1832.

Growing in little gregarious patches about a line high. Stem about as long as the peridium, which is smooth, shining, of a yellow ochre, breaking away gradually above, but persistent at the base, and crateriform. Capillitium free above, slightly attached below, sometimes falling out entire from the peridium. Sporidia globose.

This plant has very much the habit of *Trichia clavata,* of which species I considered it a form till I examined the capillitium, which is that of an *Arcyria,* being reticulate, and not filled with spiral threads.

PLATE X. fig. 3. *a,* plants of *Arcyria decipiens* magnified; *b,* capillitium, ditto; *c,* portion of capillitium with sporidia highly magnified.

XLVIII.—*Remarks on some points of Vegetable Structure.*

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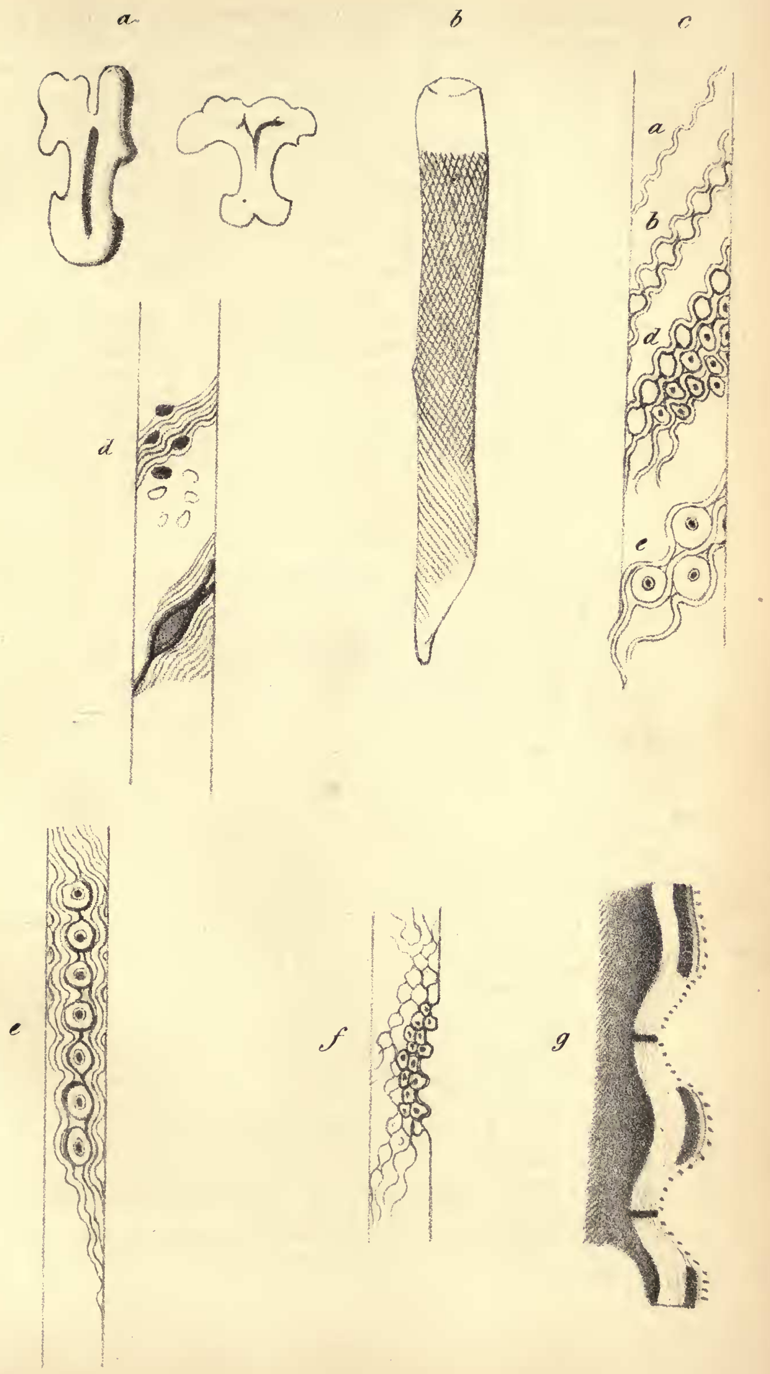
[With a Plate.]

IN the last number of the 'Linnæa' appears a paper of Mohl's*, in which the origin of a secondary layer out of spiral fibres in a vessel is denied, as also that the punctations in dotted tubes depend for their presence upon the existence of this secondary internal layer. Yet in another paragraph of the same paper it is also stated, that the first approach towards the development of the punctations is seen in the existence of a delicate *fibrous net upon* the lateral walls of the vessels, especially of those which lie next to other vessels. Now from this latter statement it certainly appears, that the presence of *fibres* is admitted by Mohl though denied in another, and also from his averment that this fibrous net is seen *upon* the lateral walls—which we take to mean externally to the homogeneous membrane of which the vessel is at first composed; we assume that he here admits its formation to be secondary in regard to period of development, though its situation is outward. Though it is denied by Mohl that the fibres are spiral, from what we have just stated, however, we could draw no other conclusion than that the existence of a *secondarily formed fibrous layer* is admitted, did it not appear contradicted afterwards by his stating that no network or fibres exist *per se,* but are only appearances. The author says, "the meshes of the net answer to the after-present circles of the dot, consequently

* A translation of this valuable paper by the Rev. M. J. Berkeley appeared, together with the plates, in our last number.—EDIT.



Dr Willshire del.

J. Basire, lithog

indicating the hollow or excavation which lies between the vessels, and the *apparent fibres* which include the meshes are *produced by the position of the walls of the vessels.*" From this it would appear then, that there is no distinct secondarily formed layer of fibrous network, but that the peculiar position of the walls of the vessel against adjacent lying structures gives rise to hollows or excavations, the circumferential edges of which constitute the fibres of the apparent net. If this proposition be really what is meant, the theory of the circle of the punctation (*der Hof des Tüpfels*), according to Mohl, is nothing further than a depressing of the primary homogeneous membrane in certain places. It is true, that the writer admits of the existence of a secondary layer, and also of fibres *running between* the punctations in certain descriptions of vessels, but this layer is not, he says, composed of spiral fibres grown together, nor have these fibres anything to do with the formation of the circle of punctation. How mere local position can give rise to such symmetry, peculiarity of form and spiral appearance which the dots and circles of punctated ducts really possess, it is to us difficult to imagine, as also what truly should be deduced from Mohl's own statement upon the subject. We would beg to offer a few remarks connected with this matter as suggested by our own observations as influenced by the recent investigations of Dr. Barry on the presence of primordial fibre. Dr. Barry has demonstrated the existence of primordial filament or fibre in bodies of animal organization, and we shall endeavour to draw an analogy between some of his views with phænomena known to exist in the vegetable kingdom. The point from which we shall start is, that in that fluid of animals which plays the part of a mediate agent in nutrition, and offers to the plastic powers of the ultimate cells a generative structural material, it has been shown corpuscular bodies exist possessing a peculiar filament or fibre, and which, through the kindness of Dr. Barry, I had an opportunity of seeing at the College of Surgeons. This gentleman remarks, that it is well known that discoid bodies circulate in plants, and it remains to be shown whether they have not filaments, and whether the spiral filamentous development is *primary* (Ann. N. Hist. vol. viii. p. 503). The juice circulating in the lactiferous tissue of vegetables contains corpuscles and variously shaped bodies, of which *Ficus*, *Vinca*, *Chelidonium*, &c., will afford illustrations. In certain species of *Euphorbia*, however (Meyen, 'Pflanzen Physiologie,' vol. ii. p. 394 *et seq.*), exist strangely and differently shaped objects circulating in the milk juice, and in which dark stripes or lines may be observed (Pl. XII. fig. *a.*): these I hold to be analogous to the phænomena shown to exist in animal blood. These objects were formerly looked upon from their peculiarity of shape as crystals; but Hartig (Erdman's and Schweiggerseidel's Journal, 1835) stated they were formed of amylum; and Meyen (*ut anteà*) regarded the stripes or lines as caused by tearings or lacerations of the inner portion of the substance of the amylaceous body by a gradual extension of its layers.

Whatever may be the peculiar forms however of these bodies, and admitting their identity of reaction as regards iodine with that of starchy material, we conceive that, so far from regarding them as not the absolute essentials of the lactiferous fluid, and as not analogous to those of the blood, the present state of our knowledge allows us to consider them as actually the same, and as forming mediate generative structural matter for vegetable tissue, since it has been shown by Mohl (Valentin's Repert., 1841) that colour varying from brown to blue may be produced in all vegetable membranes under certain conditions by iodine; and by Payen (Valentin's Repert. and Comptes Rendus) that the substance which forms the elementary structure of all plants is the same in all species, that this primary substance is *cellulosa*, that it alone forms the walls of earliest formed tissue, that it can be converted into dextrine by the action of sulphuric acid, and that it has with *amidon* a similarity of composition. To look therefore upon these bodies as mere crystals or as pieces of starch, we think now unwarranted, and they should be considered as primordial bodies of *cellulosa*; the dark lines or stripes being *probably* filaments or fibres, and the whole being analogous to the corpuscle of the blood with its filament or fibre, and which serves to produce new tissue. We confess, in our present state of knowledge with respect to vegetable anatomy, we cannot lay down as a rule, that fibre or filament is always the primary form of evolution; and we consider that, without assuming that for which we have no ocular proof, we must yet rest satisfied with believing that much tissue is not derivable from fibre. Yet that it often is, and primarily so, may be allowed; and every vegetable physiologist will have met with abundance of proof, that what, under less careful investigation, or merely ordinary circumstances, has appeared primary homogeneous membrane, has, with more care and delicate investigation, been resolvable into fibre or filament, primary and elementary. Although in many plants the parietes of lactiferous tissue are homogeneous, showing no trace of fibre, yet in *Euphorbia magnispina* they are resolvable into spiral filaments, which we are not inclined to believe are of secondary origin in these ducts, but of primary. Further, though there is abundance of evidence of secondary formation being thus derived in most plants and but little of primary, yet in others the circumstances of the case are such as to lead us to believe in the origin of the general tissues being derived from primary spiral filaments. In a new species of *Stelis* brought by Meyen from the island of Luçon scarcely any membrane is to be found not so resolvable, and surely this or much of it must be primary. In the description of this plant the physiologist just mentioned states that all the parenchymatous cells lying beneath the epidermis are composed of tissue formed by spirally wound bands, and possess no otherwise primary homogeneous enveloping membrane. In some of the larger cells where pressure is exerted, as at their terminations, the membrane appears structureless or homogeneous like ordinary membrane, but all the rest of them is distinctly formed of spiral filaments (Pl. XII. fig. *b.*). Now, from all portions and structures of this plant being so composed, save the cells of the epidermis, it would appear to be a pushing of a doctrine to maintain that the spiral fibre and filament are here but of secondary origin; and even the cells of the epidermis, we are inclined to believe, are derived from the same element, since the parchment-like cells of the aërial roots presented spiral lines, though the filaments were so firmly grown together that they could not be separated as a great part of the others could.

From the universality here evinced, we think we may not be in error in believing that Schleiden's theory, that the formation of filament does not take place independently of membrane, but occurs in the interior of cells whose membrane was originally homogeneous, meets with a great exception. The spiral lines observed by Dr. Brown on the hairs of *Tradescantia* form, we think, another. We cannot go the length of Corda, who states that the shortly articulated spiral vessels of *Nepenthes distillatoria* are devoid of an enveloping homogeneous membrane.

In that description of tissue known to vegetable anatomists by the name of fibro-cellular, there is a variety found occurring in portions of the generative apparatus of some plants in which the fibre appears totally independent of membrane in its fully developed state, and has hence been called fibre without membrane. From the investigations of some continental physiologists, however, we are prevented from accepting these instances as examples of primary fibrous development, and as yet must regard them as examples of secondary formation only. In one remarkable case, however, in which fibre occurs, in the seeds of *Collomia*, which was first published by Dr. Lindley, though Horkel is said to have demonstrated it to his class some years before, we think a true illustration of their primary development is afforded, and in which the spiral direction is at the same time very plain. It is true that some writers have stated their belief, that these spiral filaments are invested by a primary membrane, and hence that they are only secondary in appearance; but all that we conceive is, that they are surrounded by a sort of mucus, probably cytoblastemic. In the many examples found in *Orchideæ* of fibro-membranous tissue, the fibre can only be considered as forming the secondary layer. It appears to us rather difficult to say whether the branched filaments which connect together the granules of pollen in many plants are to be regarded as primary or not. In the earlier periods of antheroid evolution none are to be seen, it being only after the dissolution of the original cells in which the granules were formed that they appear.

In many of the lower orders of plants the formation of primary fibre is evident; the mesothallus of many lichens and the filaments of certain fungi illustrate the point; but in these orders great care, we conceive, must be used in drawing our conclusions, since much of fibrous and spiroid tissue—the latter in particular—is in them decidedly of secondary development. The spiroid fibres of the cells of *Sphagnum,* and the same structure which we are led to believe may be hereafter observed in *Dicranum glaucum* and *Octoblepharum albidum,* as well as the spiral filaments of *Trichia* and *Jungermannia,* are of course all secondary.

Turpin, in his reduction of vegetable forms to elementary types, assumed two conditions as the lowest; the one called *Protospheria simplex,* in which the development was spheroidal and cellular; the other *Protonemata simplex,* in which the evolution was filamentous and thread-like. These states of development have been assumed as primary and springing from a mere structureless, gelatinous phycomater or matrix, and also that the mere evolution of either of these forms—a simple cell or thread—constituted the lowest conditions of an entire vegetable organism. This theory in some points, however, is to us too vague to offer a support to the theory of primary filamentous development, since we conceive that the *Protonemata* is here secondary upon the *Protospheria.* There is only one argument in its favour, and that is, in its agreement with a law of physiology, namely, that as we get lower down in the scale of vegetable bodies, the *complications* of the elementary powers of which the higher orders are made up become fewer and fewer, until at last we get so low that scarcely any *complications* exist at all, the mere exemplification of the element as it were constituting the whole individual; but yet we think that the *Protonemata* of Turpin is not so low as this, and that we cannot stop from reducing them, however low they may be, into a *complication* of a lower form—the *Protospheria*, and in which it may truly be said scarcely anything but the exemplification of the element can be seen.

Though we believe then, that on an examination of our knowledge with respect to vegetable anatomy, much will be found in support of Dr. Barry's theory, yet much will remain, and which certainly comprises more facts than exist in favour of that theory, which entitles us to maintain that tissue exists not derived from primary filament, and that the latter is in a great mass of cases a secondary formation only. While, therefore, we would modify some statements made in the observations on the structure of *Tilia*, at p. 85, by substituting for "all tissue" "much tissue," and admitting that some membrane is composed of primordial filaments, we cannot attach less importance to the doctrine of a secondary fibrous layer there maintained.

The next point to which we shall allude is in reference to the formation of the punctation on dotted vessels. With deference to Mohl, whose views however we may have not properly made out, from the foreign language in which they are propounded, we beg leave most decidedly to differ, and believe that the origin of the punctations is immediately dependent upon a fibrous layer; and from an analogy alluded to by Dr. Barry, and a suggestion of his with regard to the teeth of a spiral filament being concerned in their production, we hold that the matter may be properly explained: on the other hand, we must remain in the opinion of Schleiden, in opposition to that of Dr. Barry, whom we consider to look upon these fibres as primary, that this fibrous layer is of secondary origin; that it is formed within a previous homogeneous membrane which alone is primary.

In all vessels in which true punctations are found, whether the central dot is surrounded by a circle or not, or whether the circle alone exists, the first approach to their formation is the production of a secondary layer of fibres upon the inner surface of the apparently primary homogeneous membrane. This layer consists of filaments, which not only have a spiral direction with respect to the duct in which they are formed, but they are bent upon themselves as it were, forming sinuous curves (Pl. XII. fig. *c.* (*a*)). In many cases the position of these filaments with respect to each other is such, that the directions of the curves are opposed to each other (as at fig. *c.* (*b*)), and in all very densely punctated vessels such appears to be the case: on the other hand, the bendings of the filament